COLLEGE STUDENTS' PERCEPTIONS AND INFORMATION SOURCES REGARDING ORGANIC AND GENETICALLY MODIFIED FOOD INDUSTRIES

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CHAPTER I

INTRODUCTION

Background and Setting

Organic Food Industry

In recent years, the organic food industry has seen increases in production and consumption of its products. "Organic food is a niche market with sustained growth over the past few decades, attracting the attention of researchers, food companies, and the United States Department of Agriculture" (Gilford & Bernard, 2006, p. 155). The American public is becoming more interested in the organic food industry as consumers ask more questions about how their food has been grown. Research shows "trust to be an important predictor of consumer attitudes" (Gilford & Bernard, 2006, p. 160).

"The Organic Trade Association reported more than 10.4 billion dollars in sales in 2003 with a growth rate of 20.4% for that year, continuing the trend of double-digit growth through the past several decades" (Gilford & Bernard, 2006, p. 155). As consumers are increasingly more interested in being environmentally conscious, sales in the organic food industry have increased. "This industry is one of the fastest growing areas of the food market in Europe, the USA and Australia" (Essoussi & Zahaf, 2008, p. 95). Organic food buyers "are driven by values belonging to three main categories: the environment; human concerns; and animal welfare" (Essoussi & Zahaf, 2008, p. 103).

The public has a growing concern about conventional farming practices and the process involved and wonders what is happening to the products as a result. Animal welfare is a main concern for many when deciding on whether to buy organic meat (Achilleas & Anastasios, 2008).

"The organic industry is moving from a niche market to a mainstream industry" (Essoussi & Zahaf, 2008, p. 102). Consumers are interested in organic foods and demand more from farmers to provide the quality of food to meet demands. The factors of food safety, animal welfare and the environment are reasons why the organic sector has seen a recent increase (Essoussi & Zahaf, 2008).

Women tend to be more interested in organics and tend to be more frequent buyers of organic foods (Tsakiridou et al., 2008). "The environmentally-[sic] conscious consumer is 'educated, affluent and mainstream' – she is educated and politically liberal. She is likely to be between the ages of 30-49, and has children six years and older…" (Davies, Titterington & Cochrane, 1995, p. 17). Consumers interested in the organic food industry also are worried about pesticides and growth hormones in food. The organic food sector's original target audience was individuals ages 18 to 29; however, this group of people is not continual buyers. Tsakiridou et al. (2008) found most college students do care about the environment and are interested in organic food, but at this point in their lives they cannot justify spending higher prices on organic food, as well as, most organic consumers have college degrees and are interested in the processing and handling of food they consume. The younger generation was the original target audience but research has shown women in their 30s to 50s are the majority of individuals buying organic products (Essoussi & Zahaf, 2008).

However, there are many reasons why some groups of people are not buying organic food. "The reasons differ according to consumer type and are strongly influenced by factors such as age and income" (Latacz-Lohmann & Foster, 1997, p. 277). Also, other research shows "two main obstacles to buying organic food seem to be the existing price difference and limited availability" (Tsakiridou et al., 2008, p. 158).

Genetically Modified Food Industry

"Genetic modification refers to the process of modifying plants or animals by adding genes to change the makeup of the original organism" (Anderson, Wachenheim, & Lesch, 2005, p. 1). Genetically modified crops have been available in the United States since 1996, and since the introduction, the genetically modified products have boomed with more acres using genetically modified technology. "Alternatively, the marketplace and policy environments have, in the case of some other crops, impeded or restricted adoption of genetically modified varieties (e.g. sugarbeets, wheat)" (Anderson, Wachemheim, & Lesch, 2005, p. 2).

Although genetic modification of crops is not a new technique, Americans' knowledge and awareness of genetic modification is low and the idea of this practice raises numerous questions. "While food products are difficult to classify as genetically modified because they are not labeled as such in the United States, many of the genetically modified ingredients are found only in processed foods" (Knight, 2007, p. 1553). In the U.S., labeling foods as genetically modified is not required and completely voluntary. However, the "European Union (EU) countries, Japan, Australia and New

Zealand, are pursuing mandatory labeling programmes for GM food products" (Rimal, Moon & Balasubramanian, 2007, p. 436).

Moreover, "most of the genetically modified ingredients are derived from only a few food staples, including corn, soy, canola, dairy, and cotton seed oil, and comprise only a small percentage of the total ingredients" (Knight, 2007, p. 1553). Research has found the public lacks understanding of biotechnology and similar practices and how many food ingredients contain genetic modification (Knight, 2007). "Even certified organic products may contain traces of genetically modified ingredients" (Knight, 2007, p. 1553).

Research has indicated the amount of involvement of the consumer will determine their attitude level on the given topic (Poortinga & Pidgeon, 2006). "When people are involved, they are more able to see the flaws of "weak" arguments" (Poortinga & Pidgeon, 2006, p. 1709). Consumers' "general attitude toward labeling of genetically modified foods is determined by the perception of positive and negative attributes of application of biotechnology in food production" (Rimal, Moon, & Balasubramanian, 2007, p. 437). Genetically modified technology makes crops resistant to insects or slows down the ripening period in fruits and vegetables. Despite some reservations regarding genetically modified technology, engineers have been able to improve conventional farming practices through increased crop yields and improved products (Knight, 2007).

About this Study

This study focused on college-aged students at Oklahoma State University, allowing the author and other researchers to better understand how this group of

individuals gathers information and makes decisions. Determining college students' perceptions of the organic and genetically modified food industries will help to determine how this group of individuals makes decisions regarding purchasing these products. Asking this group of individuals how they perceive the agriculture industry will give the agriculture sector some insight and the ability to make informed decisions about future food productions practices. Research has shown college-aged students are interested in the organic food sector but are not regular purchasers of organic products (Essoussi and Zahaf, 2008). Furthermore, research indicates younger generations are more accepting of genetically modified practices (Knight, 2007).

This study also looked at where college-aged students seek information regarding organic and genetically modified foods. "Interest in organic food has grown remarkably as consumers and marketers react to popular media about health and environmental effects of pesticides, genetically modified organisms and food safety" (Hughner, McDonagh, Prothero, Shultz II & Stanton, 2007, p. 94). Learning where college students receive their information about the organic and genetically modified food industries is critical to understand the information they receive. Also, this will allow researchers to know what media outlets cover stories about the organic and genetically modified sectors. "Perceptions of organic food are affected by [consumers'] belief about the safety and quality of conventional food production and subsequent attitudes to conventional versus organic products" (Harper & Makatouni, 2002, p. 297).

Statement of the Problem

The increase in demand for organic food encourages farmers to find alternative farming methods to stay competitive (Vindigni, Janssen, & Jager, 2002). Furthermore, with a lack of knowledge about the genetically modified food industry, consumers struggle to make informed decisions about the safety of the foods they eat (Knight, 2007). The perception of college students determines the success of new products and the longevity of a product for the future (Hugher, McDonagh, Prothero, Shultz II, & Stanton, 2007). This information allows researchers to understand what is important to college students and what they are going to expect from the agriculture industry in the future. College students will become a portion of the next generation to buy food in America, and knowing their concerns and interests will provide valuable market information for the agriculture sector.

Purpose of the Study

The purpose of this study was to determine college students' perceptions of the organic and genetically modified food industries. In addition, this study looked at where college students seek information about organic and genetically modified foods.

Research Questions

1. What are college students' perceptions of the organic food industry in the areas of health, environment, risk, and regulation?
2. What are college students' perceptions of genetically modified foods in the areas of health, environment, risk, and regulation?

3. What makes organic food more or less attractive than non-organic food to college students?
4. What makes genetically modified foods more or less attractive than non-genetically modified foods to college students?
5. Where in the media do college students obtain their information about the organic and genetically modified foods industries?
6. What are college students' current levels of acceptance of the genetically modified food industry?

Definitions of Terms

Agriculture – " the art, science or practice of producing food, feed, fiber or other products by the systematic raising of plants and animals (www.123exp-food.com/agriculture/)."

Genetically Modified Products – "the process of modifying plants or animals by adding genes to change the makeup of the original organism (Anderson, Wachenheim, & Lesch, 2006, p. 183)."

Made with Organic Ingredients – products made with 70% organic ingredients, three of which have to be listed on the back of the package, and the remaining 30% must come from the non-organic ingredients that have been approved on the National List (greenerchoices.org, 2005).

Media – "all the means of communication such as newspapers, radio, and TV (Webster's New World Dictionary and Thesaurus, 2002, p. 396)."

Natural Products – "natural products have no artificial preservatives, no artificial colors, minimally processed, no chemical additives, no artificial flavors, no artificial sweeteners, no hydrogenated oils, and non-irradiated (Robinson, 2006, p.16)."

Organic – products have 95% organically grown ingredients and 5% must come from non-organic ingredients that have been approved on the National List (greenerchoices.org, 2005).

100% Organic – products contain only organically grown ingredients (greenerchoices.org, 2005).

Sustainable Products – "sustainable products go beyond organic with environmentally and socially responsible production: natural personal care, recycled paper products, bio-friendly household cleaners, no animal testing, bio-degradable, fair trade certified, dolphin safe, vegetarian/vegan, and kosher (Robinson, 2006, p. 16)."

Limitations of the Study

This study looked at college students' perceptions of the organic and genetically modified food industries; however, the results are limited to only Oklahoma State University students who participated in this study. The results of this study reflect the opinions and ideas of the full-time student participants at OSU-Stillwater and cannot be generalized to other population frames.

Assumptions of the Study

For this study, the researcher assumed the population does not know the definition of organic and does not know what must occur for a product to be labeled organic. Also,

the population is unaware of the definition of genetically modified and the benefits or risks associated with genetically modified foods. Finally, the researcher assumed most college students gain their information from the media.

Significance of the Study

This study will allow researchers to better understand college students' perceptions of the organic and genetically modified food industries. In addition, this research will allow researchers to better understand what media college students use when seeking information about purchasing organic or genetically modified foods. College students are future buyers and will soon be making decisions on what food to purchase. Knowing how this group perceives organic and genetically modified foods will highlight areas for future research and education.

Chapter Summary

The practice of organic agriculture is not a new practice; however, it is becoming increasingly popular, as more people are interested in environment stewardship. While genetic modification also is not a new practice, consumers still lack knowledge about this practice. Determining the perceptions of college students will set the tone for how this group makes decisions about organic and genetically modified products in the future.

The purpose of this study was to determine college students' perceptions of the organic and genetically modified food industries. In addition, this study looked at where college students seek information about organic and genetically modified foods. By

identifying these perceptions, researchers and representatives of these agricultural fields will better understand the expectations of the next generation of consumers.

CHAPTER II

REVIEW OF LITERATURE

Introduction

Past literature provides a background on how people in America and other countries perceive organic and genetically modified foods (Botelho & Kurtz, 2008; Davis, Titterington & Cochrane, 1995; Saher, Lindeman & Hursti, 2006; and Tsakiridou et al., 2008); however, studies focusing on college students' perceptions of the organic and genetically modified food industries are limited (Anderson, Wachenheim, & Lesch, 2005). Previous researchers have looked at different age groups and determined the diverse perceptions on each group, but the work is limited (Stobbelarr et al., 2006). Many studies of the organic food industry are focused on other countries, not the United States (Aarset et al., 2004; Baker, Thompson & Engelken, 2004; Essoussi & Zahaf, 2008; Roddy et al., 1994; and Vindigni, Janssen & Jager, 2002). Various studies do not include perceptions of the genetically modified industry, and these studies, which discuss perceptions, tend to focus on countries other than the United States (McEachern & Willock, 2004; Krystallis et al., 2008; Harper & Makatouni, 2002; Latacz-Lohmann & Foster, 1997; and Achilleas & Anastasios, 2008).

Studies researching perceptions of organic farming have become more popular in recent years in the United States. Europe and Germany have practiced organic farming

since the early to mid-1900s, and researchers use the information collected from other countries to compare to the United States. Curtis and Moeltner (2007) found genetic modification began in the late 1990s, and consumers have mixed feelings about genetically modified products. Although organic farming is not a new practice, in recent years, the public has demanded more products from the organic industry. The existing literature provides the foundation for this study examining college students' perceptions of the organic and genetically modified food industries.

Consumers of organic products are typically women in their late 30s to 50s, and normally these consumers are interested in their health and have concerns with food not organically raised, as well as have children and at least a bachelor's degree (Davis, Titterington, & Cochrane, 1995). These consumers are concerned with animal welfare, environmental issues and knowing how their food was raised (Bellows et.al, 2008). Consumers of organic foods are willing to pay more for their food to ensure the food has no growth hormones or that unnecessary chemicals and pesticides were not used during the production process (Bellows et al., 2008). However, when consumers are asked about purchasing genetically modified products, they are unsure (Shanahan, Schefele, & Lee, 2001).

The public associates a risk with genetically modified foods (Knight, 2007). Consumers question the safety of genetically modified products and are concerned with the outcomes of eating these products (Frewer, 2003). Consumers are confused by genetically modified products and unsure about purchasing these products as they are unaware of the effects genetically modified products might have if consumed. But what most consumers don't understand is, "even certified organic products may contain traces

of GM ingredients" (Knight, 2008). Biotechnology has become widely adopted in crop production and genetic modification is used in more than 60% of processed foods (Knight, 2008).

Consumers of Organic Foods

Consumers of organic products are middle-aged individuals between 40 and 55 and have a high level of education (college degree or more) as well as a higher income to support the high prices of organic products (Bellows et.al, 2008). Females tend to purchase more organic products than males, and females with children are the largest percentage of organic customers. Typically consumers live in an urban area and are environmentally conscious, or they consider themselves a green consumer (Davis, Titterington, & Cochrane, 1995).

A study conducted in Ireland found organic consumers could be labeled into four categories:

(1) greens who are concerned with the environment;
(2) food phobics, concerned about chemical residues in food;
(3) humanists preoccupied with factory farming methods;
(4) hedonists who believe a premium product must be better and, more importantly taste better (Davies, Titterington, and Cochrane, 1995, p. 18).

Each consumer of organic food has a different understanding for the word organic (Hughner et.al, 2007). In recent years, the organic industry has become more popular in the United States, and consumers are left trying to determine fact from fiction as federal standards were adopted in 2002 (Bellows et al., 2008). When consumers go into a grocery store, many times they are unaware of what foods are organic or genetically modified versus conventionally raised. The words associated with organic tend to

confuse the consumer when deciding on what foods to purchase (Bellows et al., 2008). Younger consumers tend to be more environmentally conscious and more accepting of organic products; however, older consumers are willing to pay a higher premium for organic products (Hughner et al., 2007). The younger generation is more concerned about the foods consumed and the effect the food will have on their body later in life (Hughner et al., 2007).

A study conducted in the Netherlands evaluated 15- and 16-year-old children to determine their attitudes toward organic foods (Stobbelaar et al., 2007). The Netherlands has used several commercials promoting the organic sector and educating the population about these products. Stobbelaar et al. (2007) found that, "a higher educational level corresponds with more knowledge, a positive relationship between educational level and both knowledge and acceptance of organic food can be assumed" (p. 350).

A study conducted by Tsakiridou et al. (2008) noted women desired more information about organic foods as well as organic farming and also would buy organic products regardless of the high prices associated with the products. Also, this study concluded consumers over the age of 51 prefer organic and consider these products to be of better quality and taste. However, "university graduates strongly believe that better understanding of organics and their production process would help increase their consumption" (Tsakiridou et al., 2008, p. 171).

Growth in the Industry

"Interest in organic food has grown remarkably as consumers and marketers react to popular media about health and environmental effects of pesticides, genetically

modified organisms and food safety" (Hugher et al., 2007, p. 94). The organic industry is one of the biggest growth markets and continues to grow. This is true not only in the United States but also in many European countries, as well.

"In the United States, while conventional farming is decreasing, organic farming is increasing by 12 percent annually" (Hugher, e.al, 2007, p. 95). Organic practices continue to increase and develop more market share; however, conventional farming is still leading the market (Latacz-Lohmamn & Foster, 1997). Organic farming is gaining in popularity as consumers flock to the latest trends and fashions. Organic farming is not a new farming technique, but gained in popularity when the media began addressing how the public can become more environmentally friendly (Bellows et al., 2008). In the early 2000s, the popularity of organic products exploded into mainstream markets. However, many consumers still are unaware of the differences in farming practices and the standards of each practice.

Food products labeled as "natural" or "organic" continued to intensify in sales and approached $21 billion in 2007 (progressivegrocer.com, 2007). Even with the high volume in sales of organic products, the organic industry is still considered a niche market and attracts a minute number of consumers. Federal standards of the organic industry came in 2002 with a unified definition of organic in the United States. Before the unified definition, "the organic movement began through close collaboration between a small population of farmers, consumers, and distributors who knew each other fairly well personally and through media (e.g. newsletters) and symbols like established eco-labels" (Bellows, Onyango, Diamond, & Hallman, 2008, p. 23). Many consumers have

an idea about organic products but lack knowledge to understand what it means to have a product labeled as organic.

In Germany, consumers are aware of the organic industry and demand for organic products continues to grow; however, the potential demand and the actual demand for these products remains distant (Baker, Thompson, & Englken, 2004). Existing literature states consumers are interested in supporting locally grown products and believe buying from a local producer or from a farmer's market means they are buying organic or natural products (Baker, Thompson, & Englken, 2004). However, the consumer is unaware of the difference in the products when the products are sitting next to each other on the shelf.

Consumer Perceptions of Organic Foods

Consumers of organic foods are concerned with the health and quality of the food they eat as well as about how the food was raised and the different farming practices used in growing such products. "Consumer purchase decisions are based on subjective experiences and perceptions of organic foods" (Hughner et al., 2007, p. 95). In most cases, consumers of organic products participate in an alternative lifestyle, which can include being an environmentalist or vegetarian (Vindigni, Janssen, & Jager, 2002). Regular consumers of organic products believe organic food is healthier and a better quality than factory or traditionally processed food (Vindigni, Janssen, & Jager, 2002). Consumers believe organic products are better quality; therefore, these products also will taste better. Existing literature indicates consumers are more concerned with health than

the environment when the consumer is purchasing organic (Roddy, Cowan, & Hutchinson, 1994).

Although the organic industry now has unified definitions and labels, consumers still are confused when purchasing organic products in the grocery store. "Trusting the label suggests a belief that the label represents consistent standards, practice, and regulation" (Bellows et al., 2008, p. 4). Consumers' main reason for purchasing organic is health concerns. With the many changes in the organic sector, consumers are not sure if they trust the labels on the product. Regular customers of organic products believe organic products taste better because of the higher cost (Hugher et al., 2007). Although the organic industry has not been able to unify products to look the same in shape and appearance, consumers perceive the products to be better. Many studies have found the main reason consumers prefer organic over conventionally raised is health related (Essoussi & Zahaf, 2008; Harper & Makatouni, 2002; Onyango, Hallman, & Bellows, 2007; and Tsakiridou et al., 2008). No scientific evidence proves organic is better for a person; however, organic consumers still believe organic products are healthier or more nutritious (Harper & Makatouni, 2002).

"The term organic is referred to as a process claim, not a product claim" (Vindigni, Janssen, & Jagar, 2002, p. 625), meaning organic refers to the process of how the product was raised. However, consumers are unaware what it really means to have a product that was organically grown. The different food scares have pushed concerns toward organic products (Harper & Makatouni, 2002). Although consumers are concerned about the future and the unknown, consumers have a positive opinion toward organic and a negative opinion toward genetically modified (Hughner et al., 2007).

Genetically modified foods are deemed to be man-made and altered whereas organic foods are deemed as natural and free of chemicals (Knight, 2007). While research has shown many benefits toward genetically modified, consumers are unaware of the difference. Before the popularity of organic substances, genetically modified was introduced and provided consumers with new options to choose from when shopping for food.

Consumers know what trends are in agriculture, and consumers are conscious about the environment and ways to make the planet more natural (McEachern & Willock, 2004). However, with the growing demand of organic products, non-organic consumers' main reasons for not purchasing these products are availability of the products and the cost of these products (Anonymous, 2004). Younger shoppers, in theory, support the organic industry, but this age group is unable to afford organic products (Essoussi & Zahaf, 2008). In other countries organic farming practices are used more, and the people in those countries are able to afford more organic products as the price has been driven down (Baker, Thompson & Engelken, 2004). The United States offers government support to organic farmers; however, the yield differences between organic and conventional farming makes conventional farming more cost effective (Onyango, Hallman & Bellows, 2007).

The organic industry is not able to unify products, and many times the visual aspect of organic produce is not as favorable for consumers of non-organic foods. "Consumers in larger households (four people) consider visual product quality a significant factor that affects their intention to buy" (Tsakiridou et al., 2008, p. 172). Many times non-organic purchasers do not buy organic products because the presentation

of the product is not desirable to the consumer (Tsakiridou et al., 2008). Even though the visual presentation of organics may lack interest to the customer, many patrons are pleased with the taste of the product (Tsakiridou et al., 2008). However, taste is a factor for why organic customers purchase products, but studies have found consumers find no differences in taste when comparing organic meats to non-organic meats (McEachern & Willock, 2004).

Even though producers view organic farming as profitable for small-scale operations, consumers continue to push organic as a mainstream idea (Latacz-Lohmann & Foster, 1997). The organic industry has been marketed to consumers as a healthier, more nutritious option when shopping for groceries (Latacz-Lohmann & Foster, 1997). Many consumers do not know other words associated with different organic products (Hughner et al., 2007). Many times consumers of organic foods deem organic to be local and like the idea they are supporting the local economy (Harper & Makatouni, 2002). "Perceptions of organic food are affected by [consumers'] beliefs about the safety and quality of conventional food production and subsequent attitudes to conventional versus organic products" (Harper & Makatouni, 2002, p. 297). Consumers are concerned about the potential of food scares and in many cases deem organic better after a food outbreak crisis has happened (McEachern & Willock, 2004).

The media has framed or set the agenda about organic foods. Consumers hear from the media about the healthful benefits and how organic is the environmentally friendly choice (Hughner et al., 2007). Some consumers perceive organics as the trendy choice when it comes to buying food (Hughner et al., 2007), and recently organic foods have escalated in the media's attention. When the organic market first started, many

media outlets were unconcerned about being green, and organic production tended to be a niche market. Now, however, the media looks at organic as the wave of the future, thus altering how the public views the organic industry.

Genetically Modified Industry

When genetically modified technology was first introduced, interest in genetic modification was on the rise. However, as different practices have gained interest, consumers began looking at genetically modified foods as a risk (Botelho & Kurtz, 2008). Research has established biotechnology is widely misunderstood by the public; nevertheless, consumers are able to make decisions based on relative risk and benefits (Botelho & Kurtz, 2008). Consumers make food choices based on ethical beliefs, and not every consumer deems genetically modified technology to be negative. However, when consumers make food choices they base the choice on moral and ethical beliefs and how their beliefs match environmental concerns (Botelho & Kurtz, 2008).

Although genetically modified products do not have to be labeled in the United States, the Food and Drug Administration does require labeling if there is a new substance introduced in the product. While not every consumer views genetically modified products to be harmful, many consumers view genetically modified as risky, which leaves questions in some consumers' minds. The benefits of genetically modified products are normally not discussed by the media. "Genetically modified crops can be nutritionally enhanced (e.g., Vitamin A enhanced rice) to generate additional health benefits to consumers" (Curtis & Moeltner, 2007, p. 263). Conversely, when a consumer

sees the genetically modified label, "consumers would only buy if they cost 14% less" (Rimal, Moon, & Balasubramanian, 2007, p. 436).

The question of safety in consuming genetically modified products rose in the mid-1990s (Vilella-Vila & Costa-Font, 2008). Research discusses the media's ability to impact shoppers' decisions when purchasing food (Kalaitzandonakes, Marks, & Vickner, 2004 and Villella-Vila & Costa-Font, 2008). However, when consumers of media are actively looking for accurate information, general knowledge decreases on the particular subject area (Vilella-Villa & Costa-Font, 2008). "Thus, a lack of trust might be a key element in the role of the media influencing attitudes" (Vilella-Vila & Costa-Font, 2008, p. 2103).

Perceptions of Genetically Modified Foods

Genetically modified production leads to controversial reactions among consumers because of the perception of risk to benefit. Consumers have argued genetically modified is unnatural and can be considered altering nature (Knight, 2007). Research has found individuals have a low level of understanding of the genetically modified field and make decisions of risk and benefit without fully understanding the industry (Knight, 2007). Younger individuals are more accepting of genetically modified technology while older generations articulate concerns of risks and safety of the products (Knight, 2007). Furthermore, an individual with higher levels of education will use more ethical criteria when purchasing a product. Individuals with lower levels of income perceive more risk with technology and especially genetically modified technology. Anderson, Wachenheim & Lesch, (2005) found:

> The term biotechnology promoted acceptance to a greater extent than genetic modification and genetic engineering. Pervious purchase decisions and demographics also influenced perception of genetically modified foods. Women, consumers over 64 years of age, and consumers with low levels of education, naturalness and healthfulness as values, and previous purchasers of organic products were likely to show approval for food containing genetically modified ingredients (p. 10).

Research has found "biotechnology was supported to a much greater extent for use in crops rather than animals" (Anderson, Wachenheim & Lesch, 2005, p. 9). Consumers favored genetic modification if it could make food safer and more nutritious for consumption. "Thus, an individual who holds a negative attitude toward GMFs, for example, may use cognitive, affective or behavioral responses to reject GMF products or may display other behaviors that are congruent with this attitude" (Frewer, 2003, p. 320). However, an attitude change can occur when extra information is introduced and the information offers a strong viewpoint.

"Understanding risk perceptions is probably the most important first step in the process of understanding public attitudes toward the different processes and technologies used in agriculture and food manufacturing" (Frewer, 2003, p. 321). The public develops risk perceptions based on trust of the information provided by the media to the individual. "Distrust is associated with perception that an information source is deliberately distorting information, is promoting a biased view of reality, and has been proven wrong in the past" (Frewer, 2003, p. 327).

"Sometimes a particular risk event will result in the media coverage necessary to trigger public fears about a particular risk to provide sufficient cues to mobilize collective fears and increase perceived risk" (Frewer, 2003, p. 329). Genetically modified had gained media attention, and both the United States and European media have framed

genetically modified to be negative. Research has found "the media does have an effect on people's risk perception, although the effect is neither great nor enduring" (Frewer, 2003, p. 329). In a study conducted by Vilella-Vila & Costa-Font (2008):

> Press coverage in the UK and Spain has focused on risks and the potential hazard to public health but as it is the case in other European countries – and unlike the US – coverage of genetically modified food is to some extent driven towards emphasizing its risks, framing the reality of genetically modified food as a highly controversial issue (p. 2104).

Consumers base trust decisions on how much media attention a topic receives. Although not every person finds the media trustworthy, the amount of attention a topic gets indicates to a person if there is risk associated with the topic.

In a recent study, Townsend and Campbell (2004) found people were concerned about eating genetically modified apples because of health consequences as well as "concerns about the environment, apprehension induced by media coverage and lack of knowledge about genetically modified food" (p. 1390). Media coverage over genetically modified products has affected how individuals consider genetically modified products. While some individuals are concerned with the outcome of their health, others find no concern associated with eating genetically modified products. Some individuals are more accepting when genetic modification of animals was used for medical purposes versus for consumption.

Some consumers have concerns with genetically modified products and in Australia, "80% of Australians indicated in 2001 that they were at least "somewhat" concerned about GM food" (Wilson, Evans, Leppard & Syrtte, 2004, p.1311). Consumers buy products based on ethical and moral beliefs. "Increasing evidence demonstrates that emotions may be important in shaping risk-related decision"

(Townsend, Clarke & Travis, 2004, p. 1369). Research noted consumers indicate risk and trust as reasons not to purchase genetically modified foods. Media in the United States perceive genetically modified as negative, and consumers have become more concerned about their food choices (Vilella-Vila & Costa-Font, 2008). "However, it is important to note that the effects of the media tend to be temporary and limited in magnitude" (Vilella-Vila & Costa-Font, 2008, p. 2096).

Theoretical Framework

Agenda-Setting Theory

The agenda-setting theory serves as a foundation to understand how the media decides what information will be reported. Agenda-setting theory is used to inform the public about different topics that are taking place, not how to think about these topics. Entman (2007) found:

> Although the distinction between "what to think" and "what to think about" is not entirely clear, the former seems to mean what people decide, favor, or accept, whereas the latter refers to the considerations they "think about" in coming to such conclusions. The distinction misleads because, short of physical coercion, all influence over "what people think" derives from telling them "what to think about" (p. 165).

The agenda-setting theory has two levels associated with how the media informs the public. Weaver (2007) discusses the two levels of agenda setting: the first level of the theory discusses the importance of the issues and topics to be discussed, and the second level adds other theories like framing and priming to explain how the public's agenda is impacted by the media's agenda. The media can influence how the public views an issue and also where the issue ranks compared to the importance of other issues (Leff, Protess & Brooks, 1986).

The first level of the agenda-setting theory begins with agenda building. This level of the theory determines the issues to report (Weaver, 2007). During this level, the media is building their agenda and what topic will be covered. When the media begins defining the problem, they are framing the topic, which is the second level of the agenda-setting theory (Weaver, 2007). Framing and agenda-setting have a deep impact on the audience and also how the audience views the message (Weaver, 2007). However, Scheufele and Tewksbury (2007) explain:

> Agenda setting and framing may appear to operate by similar phenomenological process. Nonetheless, there is at least one important distinction here. Attention to messages may be more necessary for a framing effect to occur than an agenda-setting effect. Mere exposure may be sufficient for agenda setting, but it is less likely to be so for framing effects (p. 14).

The media sets the agenda, which these topics become the most important issues to the viewers (Cook et.al, 1983). Since most of the media's attention focuses on issues presented in the agenda, the media's agenda can easily be recalled by the public (Erbring, Goldenberg & Miller, 1980). How the story is presented in the media will determine how the public will interpret the message and develop an opinion on the issue. Also, Mutz and Soss (1997) found:

> Mass media can substantially influence individuals' perceptions of the nature of their social environment and perceptions of what others believe within the social environment. We infer from the evidence that media coverage often helps to guide citizens' interpretations of an important element of their political environment-reigning public evaluations of issues on the political agenda (p. 435).

Depending on what the media deems important, the audience will become aware of the issues the media is reporting. The agenda-setting theory suggests the media has an agenda and the agenda is what will become important to the public's agenda (Leff, Protess & Brooks, 1986). Thus, the media is able to set the public's agenda (Cook et al.,

1983). Both stages of the agenda-setting theory explains how the media impacts the public when determining what issues are important and what issues are less important (Weaver, 2007). The media is not only responsible for discussing new trends in different sectors but also informing the audience what is happening around the world, all while setting an agenda to determine what is really important (Holbrook & Hill, 2005).

Biotechnology and Agenda-Setting Theory

Several studies have found the media play an active role in shaping consumers' minds about genetically modified foods. "Genetically modified organisms (GMOs) only started to emerge as an issue on the public's agenda beginning in 1998" (Shanahan, Scheuffle, & Lee, 2001, p. 267). These studies examined the media coverage of genetically modified foods prior to and after 1998, and found since 1998, the media coverage of genetically modified foods is more negative than positive. "Where once journalists had tended to pay attention to the seemingly limitless benefits of genetic modification, by 1998 they were paying attention to the negative consequences" (Shanahan, Scheuffle, & Lee, 2001, p. 268). Perceptions of genetically modified foods seem to change when biotechnology is used to improve food safety and food quality (Vilella-Vila & Costa-Font, 2008).

Another study found that when comparing media coverage in the United States to that if other countries, which oppose genetic modification, the coverage was more negative in those countries (Vilella-Vila & Costa-Font, 2008). "Countries such as the U.S. and Brazil have embraced genetically modified foods, while others, such as Argentina, and the countries of the European Union have imposed restrictions on the use

and sale of genetically modified crops" (Botelho and Kurtz, 2007, p. 14). However, coverage recently in the United States is becoming more negative and focusing on risks and not benefits.

Media have the capability to frame stories and reinforce ideas and perceptions of consumers. "Research shows that consumers learn about biotechnology primarily from the media" (Botelho and Kurtz, 2008, p. 14). Newspapers have the ability to reach several different groups of people with controversial issues and shape how individuals see a certain issue. Framing topics allows the journalist to organize ideas and thoughts, which allows the public to understand relevant events. Not only is framing an issue but also word choice and images used by the journalist effect how the public thinks about topics presented in the media (Vilella-Vila & Costa-Font, 2008). The perceptions gained from the media will alter the individuals' understanding on an issue, especially if the topic is presented in a negative manner (Kalaitzandonakes, Marks & Vickner, 2004).

> With less than 2% of the U.S. population now engaged in agricultural production, the average food consumer has diminishing personal experience and knowledge of agriculture and the food production system. As a result, consumers often rely on the mass media for relevant information (Kalaitzandonakes, Marks, & Vickner, 2004, p. 1238).

The media reports on newsworthy events, which in turn sets the public's agenda. "Media informs [sic] consumers of the existence of the contamination risk and what they can do to avoid it" (Kalaitzandonakes, Marks, & Vickner, 2004, p. 1239). Consumers move different topics on their agenda based on what the media reports. "Global media have framed biotechnology as a food safety issue and has [sic] consistently raised the possibility of long-term unknown health effects" (Kalaitzandonakes, Marks, & Vickner, 2004, p. 1240). A study conducted by Kalaitzandonakes, Marks, & Vickner (2004)

found the general tone on biotechnology to be negative and found the media reported on health risks although these risks were not confirmed.

In a 2007 study, Moon, Balasubramanian, and Rimal looked at consumers' willingness to pay for non-genetically modified foods versus genetically modified foods. This study found consumers in the Midwest were willing to pay less than average for foods labeled genetically modified. The researchers were interested in learning what it would take for consumers to accept genetically modified food since agro-biotechnology is negatively perceived in the media.

Research has shown when the media frames stories based on risk the topic will move based on concern of the public's agenda and influence of the public's opinion on the topic (Kalaitzandonakes, Marks, & Vickner, 2004). Consumers' buying practices will be determined by the amount of information the consumers know about a certain product or label. When the media report negative findings or risk associated with a product, consumers begin associating a risk to the product, or consumers become unsure of what to do with the new information being provided (Savadori et al., 2004).

Chapter Summary

The typical organic consumer is a female who is in her late 30s to mid 50s and generally has children. Consumers are environmentally friendly and concerned about their health. They also have a bachelor's degree or higher degree and live in areas affluent enough to support purchasing high premium foods. Health is another concerning fact when purchasing organics; consumers perceive organic food as healthier.

Consumers also are interested in supporting the locally grown food, and purchasing food from a farmer's market as a way to accomplish supporting the local economy.

The organic food industry is on the rise and has steadily increased since the early 2000s. The organic food industry was designed as a niche market, and the industry is increasing in popularity. However, it is not able to produce the same level of food as conventional farming. Although the industry is on a steady incline, consumers are still unaware of what it means to have a product that is organic. Consumers lack an understanding of differences between genetically modified and organic (Knight, 2007).

Wilson et al. (2004) found the public misunderstands the genetically modified food industry and many consumers are concerned about the risk of eating genetically modified foods. The main reasons individuals choose not to eat genetically modified foods are health concerns, increased media attention and trust in a product (Knight, 2007). Shoppers lack knowledge in how to conclude what information is factual and what is not factual (Wilson et al., 2004). The genetically modified industry in the United States is not required to label the products unless the products have been altered and are no longer similar to the original (Rimal, Moon & Baiasubramanian, 2007). Consumers perceived genetically modified products to have a risk thus causing customers to not want to purchase these products (Huffman et.al, 2004).

The media has an agenda, and the media helps set the public's agenda (Mutz & Soss, 1997). The media is able to inform the public about what is happening around them and in this process they are also able to dictate how the public will perceive the issue (Holbrook & Hill, 2005). The public is able to view the media's agenda in the news stories covered (Leff, Protess & Brooks, 1986).

CHAPTER III

METHODOLOGY

Introduction

Background information was provided in Chapter I, which provided the purpose, significance and research questions of the study. Chapter II indentified the theoretical framework of the study and previous research related to this study. This chapter discusses the methods used to conduct this study, providing an outline for future researchers who wish to replicate this study or a similar study. This chapter will discuss the design of the study, provide information regarding population selection, discuss the development and testing of the instrument, including reliability and validity, and present data collection procedures.

Purpose of the Study

The purpose of this study was to determine college students' perceptions of the organic and genetically modified food industries. In addition, this study looked at where college students seek information about organic and genetically modified foods.

Research Questions

1. What are college students' perceptions of the organic food industry in the areas of health, environment, risk, and regulation?
2. What are college students' perceptions of genetically modified foods in the areas of health, environment, risk, and regulation?
3. What makes organic food more or less attractive than non-organic food to college students?
4. What makes genetically modified foods more or less attractive than non-genetically modified foods to college students?
5. Where in the media do college students obtain their information about the organic and genetically modified foods industries?
6. What are college students' current levels of acceptance of the genetically modified food industry?

Institutional Review Board

The research proposal was submitted to the Institutional Review Board (IRB) at Oklahoma State University for review and approval. IRB approval guarantees the research study will not harm the subjects and will protect human rights. The required materials were submitted to the IRB in February 2009. Revisions were made and final approval was granted on February 26, 2009. The approval application number was AG096 (see Appendix A).

Survey Design

An online survey process was developed based on the Dillman (2007) tailored-design method. The welcome screen (see Appendix B) of the survey outlined the significance and the purpose of the study and sought consent from the individual. The cover page also stated additional instructions on how to complete the survey. The design of the survey was a simple color scheme of orange, black and white to represent the colors of OSU giving students a familiar, comfortable color palette. The survey contained four sections allowing the respondents to focus on one area before moving to a different area of interest. The first section of the questionnaire contained 31 items relating to organic production, and students were asked questions about organic production in the areas of health, risk, environment, and regulation. The second section of the questionnaire contained 31 items relating to genetic modification, and students were asked questions about genetic modification in the area of health, risk, environment, and regulation. The third section of the questionnaire asked their viewpoints about biotechnology and about media use. This section contained eight items about levels of acceptance and the importance of biotechnology, as well as what media choices students use to learn about biotechnology. The last section of the questionnaire contained 13 items asking about student demographics. The design of the survey allowed the respondents to not answer any question they did not want to answer, as the online survey design did not force a student to answer a question before going to the next question.

Subject Selection/Population

The population for this study consisted of undergraduate and graduate students from Oklahoma State University on the Stillwater campus. The researcher acquired a list of student e-mails from the office of communications at OSU. Students targeted to participate ranged from freshman to graduate students, allowing the researcher to learn about the population of OSU students. From the list of students' e-mails, the researcher randomly selected the students to participate in the survey. Students were selected randomly through Microsoft Excel®. The researcher eliminated all students who were not full-time students, did not have an email address listed and students not on the Stillwater campus. Once all students who did not have an e-mail as well as students on other OSU campuses and non-full time students were removed, the researcher generated a random list of students, and the first 5,000 from the randomized list were invited to participate in the research study.

Randomly selecting the participants allowed the researcher to generalize back to the population. The researcher chose to send the survey to the first 5,000 students to ensure the sample size was large enough to generalize back to the population. Randomly selecting students for participation also allowed the researcher to lower sampling error as each student had an equal chance of being selected. OSU has more than 20,000 students; the researcher needed a sample of 379 students to be able to generalize perceptions regarding the organic and genetically modified food industries (Krejcie and Morgan, 1970) back to the population. Thus, the researcher over-sampled and sent out 5,000 surveys to receive the 379 needed. The participants who completed the survey were offered a chance to win one of three $100 Visa gift-cards.

Development Procedures

The survey for this study was compiled from two other studies. The researcher combined two different existing surveys to gather the information needed to answer the research questions of this study. The first study examined North Dakota college students' perceptions of the organic and genetically modified industries. The second study examined the media and where members in the media learn about biotechnology. The second study was adapted to see where college students learn about biotechnology. The compiled survey was sent to a panel of experts to examine the survey and provide feedback. After changes were made, the researcher randomly selected 40 students from the list received from the office of communication to pilot test the study and determine reliability. After 10 students completed the pilot test survey a Cronbach's alpha was completed and the coefficient from the pilot test was .741, meaning this instrument was reliable (Nunnally, 1978).

The instrument included two Likert-type scales and the remaining questions using multiple-choice questions (see Appendix C). The first Likert-type scale provided the respondents a definition of organic food production and asked the participants to answer the questions on a scale from 1 to 8 with one being strongly agree and eight being strongly disagree. In addition, the respondents were able to answer 9, which represented no opinion. The second Likert-type scale provided the respondents a definition of genetic modification and asked the participants to answer the question from 1 to 8 with one being strongly agree and eight being strongly disagree. Respondents were able to also answer 9 or no opinion for this question. Multiple choice questions asked students about their level of acceptance for biotechnology, what media choices students use to learn about

biotechnology, and the affects of biotechnology. In the demographic section, students were asked questions about where they grew up and their level of scientific knowledge. Several questions asked about habits when dining out and how many meals they eat outside of their homes, as well as several questions asking about purchasing and serving organic and genetically modified foods.

Validity and Reliability

The compiled questionnaire was sent to a panel of experts to review for content and face validity. This was important as the researcher compiled the survey from the literature and changed some items from original form. The panel consisted of the researcher's committee members, an outside faculty member to help with content and another outside faculty member whose area of focus is organic production.

This study was pilot-tested to determine reliability. The pilot test survey was sent to 40 randomly selected Oklahoma State University students, and the pilot test followed the same protocol as the actual survey. A shorter time period was set aside as only 10 respondents were needed to establish reliability. The researcher used the first 10 student responses and ran a Cronbach's alpha ($\alpha = .741$) on these responses to establish reliability.

Data Collection

Data collection started March 13, 2009, and was collected until April 7, 2009. The survey was sent to randomly selected students from an e-mail list obtained from the office of communications at Oklahoma State University. The selected students clicked

on a link in an introductory e-mail and by doing so provided their consent to participate in the survey. The researcher was able to keep the information confidential as the surveys were stored in a database maintained by the survey provider, thus allowing the researcher to gather information without directly knowing which answers corresponded to individual respondents. The researchers sent a follow-up e-mail (see Appendix D) one week after the initial survey was sent. Another follow-up email was sent two weeks after the initial survey. The researcher was able to input the data into an Excel spreadsheet based on the date of completion of the survey and randomly selected the winners for the drawing (see Appendix E).

Once the participant clicked on the link to begin the online survey, he or she provided consent and were able to omit any questions or exit at any point during the survey. However, to be entered in the drawing, participants were asked to provide their e-mail addresses and complete the survey by April 3, 2009.

Data Analysis

After data was collected, the information was retrieved from the survey database and imported into the Statistical Package for the Social Sciences (SPSS) version 16 for Windows to be analyzed. From the data collected, the researcher used descriptive statistics to determine frequencies, means, and standard deviations for each question.

The Likert-type scale questions were coded 1 through 8 based on how the respondent answered. The 9 or "no opinion" answers were replaced with an alternative value to avoid inflating the means and standard deviations.

Two questions asked about level of acceptance toward biotechnology and these questions were coded 1 for highly unacceptable, 2 for somewhat unacceptable, 3 for somewhat acceptable, and 4 for highly acceptable. One question asked about effect biotechnology will have on different areas and this question was code 1 for positive, 2 for neutral, and 3 for negative. One question asked about level of importance and this question was coded 1 for not at all important, 2 for somewhat important, 3 for important and 4 for extremely important. The last question in this section asked about obstacles to acceptance for using biotechnology and this question was coded 1 for very low, 2 for low, 3 for neutral, 4 for high, and 5 for very high.

Four questions asked about purchasing and serving organic and genetically modified foods and these questions were code 1 for yes and 2 for no. The unsure answers were replaced to avoid inflating means and standard deviations.

CHAPTER IV

FINDINGS

Introduction

Chapter I provided a background of the problem, purpose and the research questions for the study. Chapter II presented the literature reviewed and provided an overview of research in the field of individual perceptions of organic and genetically modified foods as well as an overview of the theoretical framework. Chapter III discussed the steps taken to accomplish the study and how the researcher analyzed the data. This chapter will discuss the finding for each research question.

Reliability

After the survey was sent to the 5,000 students, a post-hoc reliability analysis was conducted to determine an overall reliability coefficient. The instrument was reliable with a Cronbach's alpha of .926. Individual scaled item Cronbach's alpha coefficients ranged from .775 to .954.

Population

The population for this study was graduate and undergraduate students from Oklahoma State University, Stillwater campus. The researcher received an e-mail list of the students enrolled at OSU from the office of communications at OSU. Students asked to participate ranged from freshman to graduate students.

The researcher received the e-mail list from the office of communications and removed the students without e-mail addresses, other OSU campus students, and the non-full-time OSU students. The researcher used Microsoft Excel® to randomly assign numbers to each student and generate a random list of students. From the new randomly selected list of students, the researcher sampled the first 5,000 full-time students and sought their responses.

Response Rate

The researcher uploaded the e-mail addresses of randomly selected students into a database for e-mail distribution through surveymonkey.com, which hosted the electronic survey. From the original list of 5,000 students, nine students opted out of the survey leaving 4,991 possible respondents. The researcher needed 379 students to complete the survey to be able to generalize back to the population of Oklahoma State University, Stillwater campus students (Krejcie and Morgan, 1970). The survey resulted in 751 respondents resulting in a response rate for this survey of 15 percent.

Demographics

The survey found a majority of students were not or had not lived on a farm/ranch or owned agricultural property. From the respondents, 389 (70.1 %) did not have family who owned agricultural property and 382 respondents (68.8%) had not lived on a farm or ranch. The survey found 339 respondents (61.4%) were female. Of the respondents, 553 students replied to the question concerning age, and the study found 136 respondents

(24.8%) were over the age of 23. The remaining students' ranged in age from 18 to 23 (see Table 1).

Table 1

Age range

n	18	19	20	21	22	23
552	3	86	79	79	82	57

The majority of the students who completed the survey were classified as upperclassmen and 177 respondents (31.8%) were classified as a senior (see Table 2).

Table 2

Class rank

n	Freshman	Sophomore	Junior	Senior	Graduate Student
556	82	86	110	177	101

From the respondents, 450 students (82%) indicated having at least an average level of scientific knowledge (M = 3.45) (see Table 3).

Table 3

Level of scientific knowledge

n	L (1)	SL (2)	A (3)	SA (4)	H (5)	M	SD
554	37	67	181	147	122	3.45	1.155

Respondents indicated eating an average of three meals (M=3.00) outside of their home during the past three days (see Table 4). Each student spent an average of $5.01 to $10 on each meal (see Table 5). While dining out (see Table 6), 427 students (80.3%)

Table 4

Last 3 days meals eaten outside of home

n	1	2	3	4	More (5)	None (6)	M	SD
553	112	140	114	55	89	43	3.00	.657

Table 5

Average bill for a meal when eating out

n	$5 (1)	$5.01-$10 (2)	$10.01-$15 (3)	More than $15 (4)	M	SD
555	37	370	118	30	2.25	.657

Table 6

While dining out

"Count" Calories	Ask About Carbohydrates	Ask About Fats	Look for "Healthy" Items	Think of the Meal as a Treat	Worry About the Cost
155	23	40	368	261	427

worried about the cost of the meal and 368 students looked for "Healthy" items (69.2%) on the menu.

While respondents reported being worried about the cost of food, 358 respondents reported they would rather buy organic food versus "regular" food if prices were the same (M = 1.18) (see Table 7). If prices were the same between genetically modified and "regular" food, 486 students reported they would not or were unsure if they would purchase genetically modified foods (M =1.79) (see Table 8).

Table 7

I would rather buy organic food than "regular" food

n	Yes (1)	No (2)	Unsure (3)	M	SD
553	358	78	117	1.18	.384

Table 8

I would rather buy GM food than "regular" food

n	Yes (1)	No (2)	Unsure (3)	M	SD
552	66	243	243	1.79	.411

When students were asked if given the opportunity would they serve organic food to friends, 414 (74.7%) answered yes (see Table 9). However, when students were asked

Table 9

I would serve organic foods to my friends

n	Yes (1)	No (2)	Unsure (3)	M	SD
553	414	51	88	1.11	.313

about serving genetically modified foods to friends, 217 students (39%) were unsure and 179 (32.2%) answered no (see Table 10)

Table 10

I would serve genetically modified foods to my friends

n	Yes (1)	No (2)	Unsure (3)	M	SD
555	159	179	217	1.53	.500

Finding for Research Question One

The first research question asked, "What are college students' perceptions of the organic food industry in the areas of health, environment, risk, and regulation? The first area addressed college students' perceptions of organic food in regards to health (see Table 11). An eight-point Likert-type scale was used to evaluate perceptions of organic production in the area of health. The Likert-type scale ranged from 1 to 8 with one meaning strongly agree and eight meaning strongly disagree. Students were asked positive and negative questions about organic foods. Students agreed the "consumption of organic food can improve an overall healthy appearance" (M = 3.59), and "organic foods have the ability to enhance the quality of lives" (M = 3.76). Students disagreed organic food will detract from the quality of life (M = 6.28). Students also disagreed their overall health would decline if they consumed organically raised ingredients (M = 6.29). Students agreed "organic foods can help improve the nutritional quality of convenience foods" with a mean score of 3.47. Also students agreed "organic foods may help combat our nations problem with obesity" (M = 3.79) and "most scientists believe human health can be improved by eating food containing organic ingredients" (M = 3.61).

In the area of environment (see Table 12), students were asked questions regarding organic production and the environment. An eight-point Likert-type scale was used to answer perceptions of the organic production and the environment. Students strongly agreed with the statement "farmers raising organic crops use less amounts of pesticides than those raised by usual methods" (M = 2.87). However, students were neutral when presented with the statement "production of organic crops reduces

Table 11

General opinions about organic production - health

Question	N	No opinions	M	SD
Consumption of organic food can improve your overall healthy appearance.	713	38	3.59	2.211
Organic baby food is not as healthy as traditional baby food.	596	158	5.71	2.051
I think eating organic food will detract from the quality of my life.	697	54	6.28	3.84
Most scientists believe human health can be improved by eating food containing organic ingredients.	632	119	3.61	2.036
Introducing organic ingredients into foods poses hidden dangers to my health.	685	66	5.96	2.005
My overall health will decline if I consume food with ingredients that have been organically raised.	702	49	6.29	2.033
Organic foods can help improve the nutritional quality of convenience foods.	693	58	3.47	2.107
Baby food with organic ingredients can provide nutrients not found in traditional baby food.	600	151	4.13	2.201
Regularly eating organic food will harm myhealth.	693	58	6.34	2.007
I will live longer if I eat foods that have been organically produced.	635	116	4.33	2.095
Organic foods have the ability to enhance the quality of our lives.	684	67	3.76	2.121
Organic foods may help combat our nation's problem with obesity.	687	64	3.79	2.305
Organic foods are useful in preventing disease.	608	143	4.11	2.108

unnecessary erosion of farmland" (M = 4.25).

Students were asked questions regarding risk of the organic food industry (see Table 13). The same eight-point Likert-type scale was used and the scale ranged from one meaning strongly agree to eight meaning strongly disagree.

Table 12

General opinions about organic production - environment

Question	n	No opinions	M	SD
It is dangerous for humans to use organic production techniques to alter the composition of what we eat.	583	68	5.68	2.000
Farmers raising organic crops use less amounts of pesticides than those raised by usual methods.	674	77	2.87	2.072
Raising organic crops requires more agricultural chemicals than other methods.	629	122	5.98	2.080
Animals, as basic organisms, can benefit from organic production.	648	103	3.50	2.129
Production of organic crops reduces unnecessary erosion of farmland.	539	212	4.25	2.129

Table 13

General opinions about organic production - risk

Question	n	No Opinion	M	SD
Reducing the cost of food is reason enough to make use of organic methods.	688	63	3.95	2.235
Consumption of regular foods is far more risky than the consumption of foods containing organic ingredients.	678	73	4.36	2.187
The risks associated with organic foods far outweigh the benefits.	651	100	5.68	2.073
I would be willing to serve organic foods to my friends.	711	40	2.91	2.106
I see no risks with the consumption of organic foods.	705	46	3.03	2.033

Respondents were asked about the risks of consuming organic food and 705 students replied there are no risks with the consumption of organic foods (M = 3.03). Respondents were also asked about severing organic foods to their friend and 711 students indicated they would serve organic food to their friends (M = 2.91). Students

agreed with the statement "reducing the cost of food is reason enough to make use of organic methods" (M = 3.95).

The last area of this research question asked students about regulation in the field of organic production (see Table 14). Students were neutral with the statements "the government does not have the tools to regulate organic foods" (M = 4.72) and "the government has an effective enforcement system for the rules concerning organic foods" (M = 4.77).

Respondents indicated they were neutral when asked if they thought "the production of organic foods is being monitored effectively by the government" (M = 4.78) and "the government adequately polices the food industry with regards to organic food" (M = 4.93).

Table 14

General opinions about organic production - regulation

Question	n	No opinion	M	SD
The government does not have the tools to regulate organic foods.	622	129	4.72	2.040
The government has an effective enforcement system for the rules concerning organic foods.	551	200	4.77	2.072
The production of organic foods is being monitored effectively by the government.	575	176	4.78	1.899
The government adequately polices the food industry with regards to organic food.	564	187	4.93	1.865

Findings for Research Question Two

Research question two asked what are college students' perceptions of genetically modified foods in the areas of health, environment, risk, and regulation. Students were

give statements to react to regarding the healthiness of genetically modified foods (see Table 15). An eight-point Likert-type scale was used in the area of health in genetically modified foods. Students were asked both positive and negative questions about genetically modified foods. Respondents were neutral when asked if eating genetically modified foods will decrease quality of life (M = 4.61). When asked if "foods produced through genetic modification are completely safe to eat," students were neutral (M = 4.61). Students agreed with the statement "introducing genetically modified foods possesses hidden dangers to my health" (M = 3.94). Respondents were neutral to the statement, "most scientist believe human health can be improved by eating food containing genetically modified ingredients" (M = 4.72). Students were neutral with the statement "reducing the cost of foods is reason enough to make use of genetic modification" (M = 4.72).

The next topic area of research question two asked questions about the environment relating to genetically modified food production (see Table 16). An eight-point Likert-type scale was used for these questions. Students agreed with the statement "crops should only be enhanced by the most natural means" (M = 3.56). Respondents were neutral when asked if "farmers raising genetically modified crops use less amounts of pesticides than those raised by usual methods" (M = 4.60). Students were neutral in their opinion regarding the statement that "production of genetically modified crops reduces unnecessary erosion of farmland" (M = 4.63).

The next topic area of research question two asked about risk (see Table 17). Respondents used an eight-point Likert-type scale to respond to the questions about risk

Table 15

General opinions about genetic modification – health

Question	n	No opinions	M	SD
Consumption of GM food can improve your overall healthy appearance.	472	279	5.17	1.931
Genetically modified food is not as healthy as traditional baby food.	448	303	4.01	2.020
Genetic modification will harm society more than help it.	484	267	4.38	2.094
I think eating GM foods will decrease the quality of life.	492	259	4.71	2.129
Foods produced through GM are completely safe to eat.	485	266	4.61	1.991
Most scientists believe human health can be improved by eating food containing genetically modified ingredients.	394	357	4.72	1.886
Introducing GM ingredients into foods poses hidden dangers to my health.	484	267	3.94	1.974
My overall health will decline if I consume food with ingredients that have been genetically modified.	486	265	4.55	1.992
Reducing the cost of food is reason enough to make use of genetic modification.	502	249	4.72	2.173
Genetic modification can help improve the nutritional quality of convenience foods.	479	272	4.53	2.058
Baby food with GM ingredients can provide nutrients not found in traditional baby food.	439	312	4.35	2.090
Regularly eating genetically modified food will harm my health.	480	271	4.52	2.013
I will live longer if I eat foods that have been genetically modified.	458	293	5.60	1.868
The quality of life for humans can be improved by using biotechnology.	477	274	4.15	2.086
GM foods have the ability to enhance the quality of our lives.	481	270	4.38	2.005
GM foods may help combat our nation's problem with obesity.	470	281	4.92	2.087
Genetically modified foods are useful in preventing disease.	423	328	4.62	2.000

Table 16

General opinions about genetic modification - environment

Question	n	No opinion	M	SD
Crops should only be enhanced by the most natural means.	509	242	3.56	2.185
Farmers raising GM crops use less amounts of pesticides than those raised by usual methods.	419	332	4.60	2.167
Raising GM crops requires more agricultural chemicals than other methods.	422	329	4.32	2.044
Production of GM crops reduces unnecessary erosion of farmland.	365	386	4.62	2.001

Table 17

General opinions about genetic modification – risk

Question	*n*	*No opinion*	*M*	*SD*
Scientist are not able to accurately predict what the future outcomes may be of today's biotechnology.	466	285	3.39	1.992
Consumption of regular foods is far more risky than the consumption of foods containing genetically modified ingredients.	476	275	5.54	1.920
The risks associated with GM foods far outweigh the benefits.	464	287	4.38	2.027
I would be willing to serve genetically modified foods to my friends.	493	258	4.12	2.174
I see no risks with the consumption of genetically modified foods.	500	251	4.87	2.133

with one meaning strongly agree and eight meaning strongly disagree. Students agreed scientists are not able to accurately predict future outcomes of today's biotechnology (M = 3.39). Students were neutral with the statement "I see no risks with the consumption of genetically modified foods" (M = 4.87). Respondents also were neutral with the

statement that "consumption of regular foods is far more risky than the consumption of foods containing genetically modified ingredients" (M = 5.54).

The last area in research question two asked about regulation of the genetically modified food industry (see Table 18). Using the same eight-point Likert-type scale, students were neutral with the statement that "the government has an effective enforcement system for the rules concerning genetically modified foods" (M = 5.13). Also, students were neutral in response to the statement that "the production of genetically modified foods is being monitored effectively by the government" (M = 5.12). Respondents were neutral to the statement that, "the government does not have the tools to regulate genetically modified foods" (M = 4.21).

Table 18

General opinions about genetic modification – regulation

Question	n	No opinion	M	SD
The government does not have the tools to regulate GM foods.	435	316	4.21	2.214
The government has an effective enforcement system for the rules concerning genetically modified foods.	403	348	5.13	2.020
The production of GM foods is being monitored effectively by the government.	410	341	5.12	1.987
The government adequately polices the food industry with regards to genetically modified foods.	401	350	5.03	1.990

Findings for Research Question Three

Research question three asked respondents what makes organic food more or less attractive than non-organic food to college students. This part of the survey asked several

questions regarding the different areas of health and risk to determine what makes organic food more or less attractive than non-organic food (see Table 19). Students agreed "consumption of organic foods can improve your overall healthy appearance" (M = 3.59). Respondents agreed with the question "foods produced by organic means are completely safe to eat" (M = 3.84). Students were neutral to organic foods have the ability to enhance quality of lives (M = 4.93).

Table 19

Attractiveness of organic foods than non-organic foods

Question	n	M	SD
Consumption of organic foods can improve your overall healthy appearance	713	3.59	2.211
Foods produced by organic means are completely safe to eat.	702	3.84	2.231
Organic foods have the ability to enhance the quality of our lives.	654	4.93	1.865
I would be willing to serve organic foods to my friends.	711	2.91	2.106
I see no risks with the consumption of organic foods.	705	3.03	2.033

Finding for Research Question Four

Research question four asked students what makes genetically modified foods more or less attractive than non-genetically modified foods to college students. This question presented several statements regarding health and risk to determine what makes genetically modified foods more or less attractive than non-genetically modified foods (see Table 20). Respondents were neutral to the question "regularly eating genetically modified foods will harm my health" (M = 4.52). Also, students indicated they were neutral regarding the statement "I will live longer if I eat foods that have been genetically

Table 20

Attractiveness of genetically modified foods than non-genetically modified foods

Question	n	M	SD
Regularly eating genetically modified foods will harm my health.	480	4.52	2.013
I will live longer if I eat foods that have been genetically modified.	458	5.60	1.868
Consumption of regular foods is far more risky than the consumption of foods containing genetically modified ingredients.	476	5.54	1.920
I would be willing to serve genetically modified foods to my friends.	493	4.12	2.174
I see no risks with the consumption of genetically modified foods.	500	4.87	2.133

modified" (M = 5.60). Students were neutral when asked "consumption of regular foods is far more risky than the consumption of foods containing genetically modified ingredients" (M = 5.54).

Finding for Research Question Five

Research question five asked where do college students obtain their information in the media about the organic and genetically modified foods industry. Students were asked to indicate all areas used to learn about biotechnology (see Table 21). A majority if respondents (n = 337, 64.6%) indicated they receive information about biotechnology through television. The next largest source was newspapers, with 296 (56.8%) students using newspapers as their primary source of information. For all responses given in the other category, see Appendix F.

Table 21

Media Sources used to learn about biotechnology

n	Newspaper	Scientific Journals	Technical Publications	Popular Magazines	Television	Other
751	296	190	88	135	337	169

When students were asked about the last time they sought out information about biotechnology, 190 respondents (34.3%) indicated they had studied biotechnology less than six months ago (see Table 22), while 118 respondents (21.3%) indicated they had never read or studied biotechnology.

Table 22

Last read or studied about biotechnology

n	Less than a week	Less than 6 months	Less than a year	More than a year	Never
554	72	190	97	77	118

Findings for Research Question Six

Research question six asked what are college students' current levels of acceptance of the genetically modified food industry. College students were asked several questions relating to the different types of biotechnology research, and the students then answered according to how acceptable the research practices were. Students were somewhat acceptable to genetically modified micro-organisms (M = 2.72). Respondents were also somewhat acceptable to genetic modification of forest/landscape plants (M = 2.82) and genetic modification of food crops (M = 2.71) (see Table 23). However, genetically modifying animals and humans was deemed unacceptable (M = 2.10 and M = 1.66, respectively).

The respondents were somewhat acceptable to biotechnology involving insect-resistant corn (M = 2.84), insect resistant cotton (M = 2.94), slow vine-ripening tomatoes (M = 2.82) and herbicide resistant soybeans (M – 2.76) (see Table 24).

Table 23

Level of acceptance of genetic modification with the following organisms

	n	HU (1)	SU (2)	SA (3)	HA (4)	M	SD
Micro-organisms	545	69	122	248	106	2.72	.920
Forest/Landscape Plants	547	61	105	252	129	2.82	.918
Food Crops	548	82	106	249	111	2.71	.955
Animals	550	197	152	149	52	2.10	.999
Humans	548	322	110	94	22	1.66	.899

Table 24

Current level of acceptance of biotechnology practices

	n	HU (1)	SU (2)	SA (3)	HA (4)	M	SD
Insect resistant corn	546	62	101	244	139	2.84	.933
Insect resistant cotton	547	53	89	243	162	2.94	.919
Slow vine-ripening tomatoes	545	62	100	258	125	2.82	.915
Herbicide resistant soybeans	545	66	116	246	117	2.76	.925

The researcher asked about how biotechnology will impact (positive, neutral or negative) different areas (see Table 25). Respondents (80%) had a neutral to negative opinion regarding biotechnology's impact on fish and wildlife, while 58% of respondents believe biotechnology will have a positive impact on world hunger. Nearly half of students (43%) indicated biotechnology will negatively impact family farms while two-

Table 25

Biotechnology effect on the following areas

	N	Positive (1)	Neutral (2)	Negative (3)	M	SD
Fish and wildlife	548	113	204	231	2.22	.763
World hunger	548	316	180	52	1.52	.664
Family farms	549	163	152	234	2.13	.841
Healthful foods	545	183	228	134	1.91	.758

thirds (67%) reported they believe biotechnology will have a neutral to negative impact on healthful foods.

Students were asked about level of importance in biotechnology research (see Table 26). Most students (97%) indicated safer foods was at least a somewhat important area of biotechnology research, while 95% of respondents indicated harming the environment to be an extremely important area of biotechnology research.

The data showed college students reported being unsure or neutral when talking about genetically modified products. Respondents answered that fear of harming the environment was an obstacle for accepting biotechnology food practices (M = 3.71) (see Table 27). Additionally, students were concerned with food safety consequences as an obstacle for accept biotechnology (M = 3.67).

Respondents reported being somewhat aware (M =2.13) of how biotechnology will affect food, health, and the environment (see Table 28). This study has found students were concerned with the environment and the effects of biotechnology practices on the environment (M = 2.13).

Table 26

Level of importance should be placed on food biotechnology research

	N	NI (1)	SI (2)	I (3)	EI (4)	M	SD
Reduction of pesticides	548	23	139	216	170	2.97	.856
Benefits to the environment	546	19	92	180	255	3.23	.851
Control of released genes	544	37	162	188	157	2.85	.916
Safer foods	547	17	67	204	259	3.29	.799
Harming the environment	547	28	85	159	275	3.24	.897
Added nutritional value	546	26	128	217	175	2.99	.864
Risk compared to pesticides	545	21	119	200	205	3.08	.862

Table 27

Obstacles to acceptance for using biotechnology in food

	n	VL (1)	L (2)	N (3)	H (4)	VH (5)	M	SD
Religious/Ethical concerns about "tampering with nature"	550	161	103	107	108	71	2.68	1.405
Fear of genes moving unchecked to other plants, insects, or micro-organisms	550	48	74	146	185	97	3.38	1.176
Fear of food safety consequences	549	33	62	107	196	151	3.67	1.166
Fear of environmental harm	548	34	55	107	194	158	3.71	1.166

Table 28

Biotechnology affect on food, health, and environment

n	Yes (1)	Somewhat (2)	No (3)	M	SD
559	89	312	158	2.13	.655

Chapter Summary

College students at Oklahoma State University agreed with many statements indicating organic foods as a healthy, non-risky, environmentally friendly food option. Students agreed they perceive organic foods to be completely safe to eat and would be willing to serve organic foods to their friends. However, students at Oklahoma State University reported being unsure or neutral in how they perceive genetically modified foods. When students were asked about genetically modified foods their responses were neutral or no opinion. Students were asked if they would rather purchase "regular" foods versus genetically modified foods and they chose "regular." "Regular" foods were perceived as less risky and safer to eat than genetically modified foods.

Students were neutral when asked about genetically modified products being environmentally friendly. Although students find organic foods to be more desirable than genetically modified foods, students were neutral on regulation for either group. A majority of students learn about biotechnology and organic methods through television. Students indicted they have an average level of knowledge of scientific knowledge. However, students are somewhat accepting of biotechnology of micro-organisms, forest/landscape plants or food crops, and are not willing to accept biotechnology research with animals and humans.

Finally, respondents were somewhat aware of how biotechnology will affect food, health, and the environment and were concerned with the effects of biotechnology practices on the environment.

CHAPTER V

CONCLUSIONS, DISCUSSION, AND RECOMMENDATIONS

Introduction

Chapter I provided background information of the study and included statement of the problem as well as the purpose. Chapter II provided an overview of relevant literature related to this research project. Chapter III offered a step-by-step description of the methods and procedures used to conduct this study as well as a discussion of data analysis. Chapter IV discussed the findings of this study related to each research question.

Summary of Findings

College students at Oklahoma State University agreed with many statements indicting organic foods as a healthy, non-risky, environmentally friendly food option. Students agreed they perceive organic foods to be completely safe to eat and would be willing to serve organic foods to their friends. However, students at Oklahoma State University reported being unsure or neutral in how they perceive genetically modified foods. When students were asked about genetically modified foods their responses were neutral or no opinion. Students were asked if they would rather purchase "regular" foods versus genetically modified foods and they chose "regular." "Regular" foods were perceived as less risky and safer to eat than genetically modified foods.

Students were neutral when asked about genetically modified products being environmentally friendly. Although students find organic foods to be more desirable than genetically modified foods, students were neutral on regulation for either group. A majority of students learn about biotechnology and organic methods through television. Students indicted they have an average level of knowledge of scientific knowledge. However, students are somewhat accepting of biotechnology of micro-organisms, forest/landscape plants or food crops, and are not willing to accept biotechnology research with animals and humans.

Conclusions

After analyzing the data, the researcher was able to make conclusions about the information collected. The data showed a majority of students receive information about organic and genetically modified foods from the television. An assumption made by the researcher in chapter one is students receive news information from the media. This conclusion supports that statement thus showing the media helps shape opinions students may have about organic and genetically modified foods. The researcher used agenda setting theory to indicate the media plays a role in the public's perception of newsworthy topics. The results of the survey indicated college students favor organic foods and find them a healthy, less risky food option. However, many students were unsure about or had no opinion about genetically modified foods. Students found genetic modification as a risky, unsafe food option. The data gathered from the survey regarding how the media portrays organic and genetically modified products were similar. The media has indicated organic as healthy, safe to eat, and environmentally friendly. Genetically

modified products have been portrayed as risky, unsafe, and unnatural. Responses to this study were similar study of North Dakota college students' responses (Anderson, Wachemheim, & Lesch, 2005). Both groups of college students find organic foods to be healthy and environmentally friendly. As well, both groups find genetically modified foods as risky and were neutral in responses to statements about genetically modified foods. Students were mixed in their perceptions about genetically modified foods.

Students were interested in organic foods and serving organic foods to friends, however, many students were unsure or did not want to serve genetically modified foods to their friends. Students also indicted they would rather buy organic food verses "regular" food and would rather buy "regular" than genetically modified foods. After the researcher read answers about where college students learn about organic and genetically modified foods, the author can conclude many students are unaware of the many different definitions of organic and how much food contains genetically modified ingredients. Many students have never studied genetically modified foods and other students only studied the information within the last six months. The data found in this study is similar to the data a study conducted by Vestal (1998). Knowledge on the subject was low in both studies. College students and individuals in the media were highly unacceptable to the idea of biotechnology practices with humans and animals. However, both groups were somewhat acceptable to the idea of biotechnology practices involving corn, cotton, tomatoes, and soybeans.

In this study, more students answered questions on the topic of organic than genetically modified. The researcher can conclude that college students know how they feel about organic food and their opinion is positive. However, students are unsure or

have mixed feelings about genetically modified foods, as there was more neutral and no opinions answered in this section. Since the introduction of genetically modified foods, the media has sent mixed messages about the safety of genetic modification of foods. College students receive information about organic and genetically modified foods from the television and in turn answer questions about this topic similar to how the media has portrayed the information. However, the researcher can also conclude students have limited knowledge about genetically modified foods, since most of the students answered they would rather buy "regular" food versus genetically modified. The United States does not require genetically modified foods to be labeled and many individuals are unaware they are consuming genetically modified products on a regular basis. The media has played a role in shaping how college students perceive different topics, but especially in the area of organic and genetically modified food sectors.

Discussion

In reviewing the literature presented in chapter two, the researcher found similar results to previous studies. The literature discussed how the media has portrayed both organic and genetically modified foods and the information gathered matches what other researcher have found. Existing literature indicates organic products to be healthy, risk free, and environmentally friendly; where as genetically modified products are unhealthy, risky, and unnatural. The students surveyed in this study indicated similar responses. Although students' responses were varied when asked about genetically modified products, many still remained unsure or neutral. The literature stated, "the public associates a risk with genetically modified foods" (Knight, 2007), which could explain

why the respondents of the survey answered mainly neutral or unsure on the genetically modified section.

Students did support organic food and would purchase more organic products if it were cheaper. Younger shoppers, in theory, support the organic industry, but this age group is unable to afford organic products (Essoussi & Zahaf, 2008). Responses to this study indicated in the last three days students have eaten two meals outside of their home and spend approximately five to ten dollars on each meal. Students reported they worry about the cost of the meal when dinning out; they also look for healthy items on the menu. The responses to the organic section were not surprising as the answers matched what the media reports about organic products. Stobbelaar et al. (2007) found that, "a higher educational level corresponds with more knowledge, a positive relationship between educational level and both knowledge and acceptance of organic food can be assumed" (p. 350). The literature also states college students would be more accepting of genetically modified products and the results of this survey show students were neutral or unsure about genetically modified products. Younger individuals are more accepting of genetically modified technology while older generations articulate concerns of risk and safety of products that have been genetically modified (Knight, 2007).

Although students responded neutral or negative to questions relating to genetically modified foods, students indicated studying about biotechnology within the last six months. The survey provided a place for students to indicate where they learn about biotechnology. If students had never studied biotechnology then they are unaware what products use biotechnology. Biotechnology has become widely adopted in crop production and genetic modification is used in more than 60% of processed foods

(Knight, 2008). Also if students were uneducated about biotechnology then why would students rather buy "regular" food versus genetically modified? This statement is an example that the media does have an impact on how the public thinks about genetic modification. The media does not report about the different classifications of organic or "even certified organic products may contain traces of GM ingredients" (Knight, 2008).

Furthermore, the literature states an individual with higher levels of education will use more ethical criteria when purchasing a product. Given this, students would need to know more information about organic and genetically modified products before making a decision regarding which is better. Since students rely on the media to provide information about organic and genetically modified foods then the media is deciding which type of product is better. The data from this survey showed organic foods have a positive connotation associated with it where genetically modified has a negative connotation. "Where once journalists had tended to pay attention to the seemingly limitless benefits of genetic modification, by 1998 they were paying attention to the negative consequences" (Shanahan, Scheuffle, & Lee, 2001, p. 268).

Recommendations

Future research needs to be done in this area, particularly the perceptions of the genetically modified industry. Students were not opposed to genetic modification, but they also did not have clear responses when asked about the industry. Also, more research should be conducted with other college students to see if their responses are similar or different regarding their perceptions of organic and genetically modified foods and how the media has impacted their decision-making regarding choices surround these

food options. Researching how the media frames topics, especially biotechnology, and the impacts of these frames when making decisions at the grocery store would also be a great addition to this literature base.

Additional research needs to examine the words used when discussing biotechnology to compare the results of biotechnology versus genetically modified. Also, how the media frames the story and if the words the media uses determines if individuals identify more with one word versus another. Do different words cause different feeling or emotions verses other words?

Additional research should be conducted in the area using agenda-setting theory and biotechnology practices to see how the public responds to the media. In addition, more studies should be conducting using the media to examine how individuals perceive different areas of agriculture based frames, as well as more studies on how the opinions of the public changes when the media frames a topic in a different way than how it was presented originally.

More studies should be conducted across other college campuses to determine if similar results would occur if similar information was collected. College students are the next group making the decisions on what is being demanded; understanding this population group will allow farmers and agriculturalists to know how to market and communicate about their products in the future.

Finally, researchers should take a global approach in looking at the impacts media frames have on public perceptions about food and agricultural products. In particular, research should focus on how media in different regions of the world impact decisions. This type of research could then be compared to educational level, age and other

demographic factors to learn more about if certain demographic segments are more susceptible to media influences in their decision-making abilities.

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APPENDICES

APPENDIX A

INSTITUTIONAL REVIEW BOARD

Oklahoma State University Institutional Review Board

Date:	Thursday, February 26, 2009
IRB Application No	AG096
Proposal Title:	College student perceptions of organic and biotechnology foods
Reviewed and Processed as:	Exempt

Status Recommended by Reviewer(s): Approved Protocol Expires: 2/25/2010

Principal Investigator(s):

Megan Lawrence
370 Student Union
Stillwater, OK 74078

Dwayne Cartmell
448 Ag
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Shelia Kennison, Chair
Institutional Review Board

APPENDIX B

INFORMED CONSENT/COVER LETTER TO SURVEY

I need your help by completing an online survey!! The purpose of this survey is to determine college students' perceptions of organic and genetically modified foods. Your name was randomly selected from a database of OSU students provided by the OSU Office of Communications. I am conducting this research study as part of my requirements to complete an agricultural communications master's degree at OSU. Your participation will provide valuable insight into college students' opinions and attitudes toward the organic food industry and the genetically modified food industry. This information allows the agriculture industry to have a better understanding of the consumers purchasing products.

Your participation in this research study is voluntary, and you may decide to exit the survey Web site at any time without any penalty. There are no known risks associated with this project, which are greater than those ordinarily encountered in daily life.

The information collected from this research study will be kept private. All records will discuss group findings and will not include information that will indentify you. All records will be stored securely and only the researcher and individuals responsible for research oversight will have access to the records.

Individuals who complete the survey by midnight on March 13, 2009, will have an opportunity to win one of three $100 visa gift cards. Individuals will be asked to submit their email address at the end of the survey so they can be notified if they are a winner. The email address will not be linked to the individual who completed the survey nor will the information in the survey be linked to the individual. The survey will take approximately 20 minutes to complete.

If you have any questions about this research, please contact Megan Lawrence at 913-634-9596, or megan.lawrence@okstate.edu.

If you have questions about your rights as a research volunteer, you may contact Dr. Shelia Kennison, IRB chair, 219 Cordell North, Stillwater, OK 74078, 405-744-1676 or irb@okstate.edu.

By clicking on the following link, you are giving your consent to participate in this research study:

http://www.surveymonkey.com/s.aspx?sm=hWHJhSzOMQIZuUVZqKEgyA_3d_3d

APPENDIX C

QUESTIONNAIRE

College Students' Perception of Organic and Genetically Modified

Organic Food Production

What is organic food production?

Organic production is a system of farming that minimizes the use of off-farm inputs. Certified organic means agricultural products have been grown and processed according to the United States Department of Agriculture's national organic standards and certified as such. The requirements apply to the production process rather than measurable characteristics of the product itself.

Certifying agents review applications from farmers and processors for eligibility and qualified inspectors conduct annual on-site inspections of operations. Inspectors talk with operators and observe their production and processing practices to determine if they are in compliance with organic standards. Organic standards for crops require, for example, that no prohibited substance be applied to the land during the previous three years and that crops not be genetically modified. Those for livestock require animals not be given hormones or antibiotics, and they have access to the outdoors.

With this information in mind, please rate your perception of the following statements on the scale, keeping in mind:

1 = Strongly Agree
8 = Strongly Disagree

If you don't have an opinion on a statement then please check the circle under "No Opinion."

1. General Opinions About Organic Production

	1	2	3	4	5	6	7	8	No Opinion
The government does not have the tools to properly regulate organic foods.	○	○	○	○	○	○	○	○	○
Consumption of organic foods can improve your overall healthy appearance.	○	○	○	○	○	○	○	○	○
Organic baby food is not as healthy as traditional baby food.	○	○	○	○	○	○	○	○	○
Organic food will harm society more than help it.	○	○	○	○	○	○	○	○	○
I think eating organic foods will detract from the quality of my life.	○	○	○	○	○	○	○	○	○
Foods produced by organic means are completely safe to eat.	○	○	○	○	○	○	○	○	○
Most scientists believe human health can be improved by eating foods containing organic ingredients.	○	○	○	○	○	○	○	○	○
It is dangerous for humans to use organic production techniques to alter the composition of what we eat.	○	○	○	○	○	○	○	○	○
Introducing organic ingredients into foods poses hidden dangers to my health.	○	○	○	○	○	○	○	○	○
Farmers raising organic crops use less amounts of pesticides than those raised by usual methods.	○	○	○	○	○	○	○	○	○
Scientists are not able to accurately predict what the future outcomes may be of	○	○	○	○	○	○	○	○	○

College Students' Perception of Organic and Genetically Modified

today's organic technologies.									
My overall health will decline if I consume foods with ingredients that have been organically raised.	○	○	○	○	○	○	○	○	○
Reducing the cost of foods is reason enough to make use of organic methods.	○	○	○	○	○	○	○	○	○
Organic foods can help improve the nutritional quality of convenience foods.	○	○	○	○	○	○	○	○	○
The government has an effective enforcement system for the rules concerning organic foods.	○	○	○	○	○	○	○	○	○
Baby food with organic ingredients can provide nutrients not found in traditional baby food.	○	○	○	○	○	○	○	○	○
The production of organic foods is being monitored effectively by the government.	○	○	○	○	○	○	○	○	○
Regularly eating organic foods will harm my health.	○	○	○	○	○	○	○	○	○
I will live longer if I eat foods that have been organically produced.	○	○	○	○	○	○	○	○	○
Raising organic crops requires more agricultural chemicals than other methods.	○	○	○	○	○	○	○	○	○
The quality of life for humans can be improved by using organic methods.	○	○	○	○	○	○	○	○	○
Organic foods have the ability to enhance the quality of our lives.	○	○	○	○	○	○	○	○	○
The government adequately polices the food industry with regards to organic foods.	○	○	○	○	○	○	○	○	○
Consumption of regular foods is far more risky than the consumption of foods containing organic ingredients.	○	○	○	○	○	○	○	○	○
Animals, as basic organisms, can benefit from organic production.	○	○	○	○	○	○	○	○	○
Production of organic crops reduces unnecessary erosion of farmland.	○	○	○	○	○	○	○	○	○
Organic foods may help combat our nation's problem with obesity.	○	○	○	○	○	○	○	○	○
The risks associated with organic foods far outweigh the benefits.	○	○	○	○	○	○	○	○	○

College Students' Perception of Organic and Genetically Modified

Organic foods are useful in preventing disease.	○	○	○	○	○	○	○	○	○
I would be willing to serve organic foods to my friends.	○	○	○	○	○	○	○	○	○
I see no risks with the consumption of organic foods.	○	○	○	○	○	○	○	○	○

Genetic Modification

What is Genetic Modification?

Genetic modification refers to the process of modifying plants or animals by adding genes to change the makeup of the original organism.

The traditional plant development process uses cross breeding, which requires plants to be sexually alike, transfers and sorts all genetic materials, and takes time. The genetic modification process moves genetic material from one organism to another such as from bacteria to plants, animals to plants and between dissimilar plants.

It produces plants or animals with desired characteristics faster than classical cross breeding methods.

Sometimes the process of genetic modification is called bio-engineering, biotechnology, or genetic engineering.

With this information in mind, please rate your perception of the following statements on the scale, keeping in mind:

1 = Strongly Agree
8 = Strongly Disagree

If you don't have an opinion on a statement then please check the circle under "No Opinion."

2. General Opinions About Genetic Modification

	1	2	3	4	5	6	7	8	No Opinion
The government does not have the tools to properly regulate genetically modified foods.	○	○	○	○	○	○	○	○	○
Consumption of genetically modified foods can improve your overall healthy appearance.	○	○	○	○	○	○	○	○	○
Genetically modified baby food is not as healthy as traditional baby food.	○	○	○	○	○	○	○	○	○
Genetic modification will harm society more than help it.	○	○	○	○	○	○	○	○	○
Crops should only be enhanced by the most natural means.	○	○	○	○	○	○	○	○	○
I think eating genetically modified foods will decrease the quality of my life.	○	○	○	○	○	○	○	○	○
Foods produced through genetic modification are completely safe to eat.	○	○	○	○	○	○	○	○	○
Most scientists believe human health can be improved by eating foods containing genetically modified ingredients.	○	○	○	○	○	○	○	○	○

College Students' Perception of Organic and Genetically Modified

It is dangerous for humans to use biotechnology to alter the composition of what we eat.	○	○	○	○	○	○	○	○	○
Introducing genetically modified ingredients into food poses hidden dangers to my health.	○	○	○	○	○	○	○	○	○
Farmers raising genetically modified crops use less amounts of pesticides than those raised by usual methods.	○	○	○	○	○	○	○	○	○
Scientist are not able to accurately predict what the future outcomes may be of today's biotechnology.	○	○	○	○	○	○	○	○	○
My overall health will decline if I consume foods with ingredients that have been genetically modified.	○	○	○	○	○	○	○	○	○
Reducing the cost of foods is reason enough to make use of genetic modification.	○	○	○	○	○	○	○	○	○
Genetic modification can help improve the nutritional quality of convenience foods.	○	○	○	○	○	○	○	○	○
The government has an effective enforcement system for the rules concerning genetically modified foods.	○	○	○	○	○	○	○	○	○
Baby food with genetically modified ingredients can have nutrients not found in traditional baby food.	○	○	○	○	○	○	○	○	○
The production of genetically modified foods is being monitored effectively by the government.	○	○	○	○	○	○	○	○	○
Regularly eating genetically modified foods will harm my health.	○	○	○	○	○	○	○	○	○
I will live longer if I eat foods that have been genetically modified.	○	○	○	○	○	○	○	○	○
Raising genetically modified crops requires more agricultural chemicals than other methods.	○	○	○	○	○	○	○	○	○
The quality of life for humans can be improved by using biotechnology.	○	○	○	○	○	○	○	○	○
Genetically modified foods have the ability to enhance the quality of our lives.	○	○	○	○	○	○	○	○	○
The government adequately polices the food industry with regards to genetically	○	○	○	○	○	○	○	○	○

College Students' Perception of Organic and Genetically Modified

modified foods.									
Consumption of regular foods is far more risky than the consumption of foods containing genetically modified ingredients.	○	○	○	○	○	○	○	○	○
Production of genetically modified crops reduces unnecessary erosion of farmland.	○	○	○	○	○	○	○	○	○
Genetically modified foods may help combat our nation's problem with obesity.	○	○	○	○	○	○	○	○	○
The risks associated with genetic modification of foods far outweigh the benefits.	○	○	○	○	○	○	○	○	○
Genetically modified foods are useful in preventing disease.	○	○	○	○	○	○	○	○	○
I would be willing to serve genetically modified foods to my friends.	○	○	○	○	○	○	○	○	○
I see no risks to the consumption of genetically modified foods.	○	○	○	○	○	○	○	○	○

Viewpoints and the Media

3. Are you aware of how biotechnology will affect your food, health, and environment?

- ○ Yes
- ○ Somewhat
- ○ No

4. What media source(s) have you used to learn about biotechnology? Mark all that apply.

- ☐ Newspaper
- ☐ Scientific Journals
- ☐ Technical Publications/Reports
- ☐ "Popular" Magazines
- ☐ Television
- ☐ Other

Other (please specify)

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College Students' Perception of Organic and Genetically Modified

5. When did you last read or study about biotechnology?

- ◯ Less than one week ago
- ◯ Less than six months ago
- ◯ Less than a year ago
- ◯ More than a year ago
- ◯ Never

6. What is your current level of acceptance of genetic modification of the following organisms?

	Highly Unacceptable	Somewhat Unacceptable	Somewhat Acceptable	Highly Acceptable
Micro-organisms	◯	◯	◯	◯
Forest/Landscape Plants	◯	◯	◯	◯
Food Crops	◯	◯	◯	◯
Animals	◯	◯	◯	◯
Humans	◯	◯	◯	◯

7. What is your current level of acceptance of biotechnology practices involving ...

	Highly Unacceptable	Somewhat Unacceptable	Somewhat Acceptable	Highly Acceptable
Insect Resistant Corn	◯	◯	◯	◯
Insect Resistant Cotton	◯	◯	◯	◯
Slow Vine-Ripening Tomatoes	◯	◯	◯	◯
Herbicide Resistant Soybeans	◯	◯	◯	◯

8. Do you believe biotechnology will have a positive, neutral or negative effect on ...

	Positive	Neutral	Negative
Fish and Wildlife	◯	◯	◯
World Hunger	◯	◯	◯
Family Farms	◯	◯	◯
Healthful Foods	◯	◯	◯

9. In your opinion, what level of importance should be placed on food biotechnology research regarding ...

	Not at all Important	Somewhat Important	Important	Extremely Important
Reduction of Pesticides	◯	◯	◯	◯
Benefits to the Environment	◯	◯	◯	◯
Control of Released Genes	◯	◯	◯	◯
Safer Foods	◯	◯	◯	◯
Harming the Environment	◯	◯	◯	◯
Added Nutritional Value	◯	◯	◯	◯
Risk Compared to Pesticides	◯	◯	◯	◯

College Students' Perception of Organic and Genetically Modified

10. To what degree do you consider each of the following to be obstacles to your acceptance for using biotechnology in food production?

	Very Low	Low	Neutral	High	Very High
Religious/Ethical Concerns About "Tampering with Nature"	○	○	○	○	○
Fear of Genes Moving Unchecked to Other Plants, Insects or Micro-organisms	○	○	○	○	○
Fear of Food Safety Consequences	○	○	○	○	○
Fear of Environmental Harm	○	○	○	○	○

Demographics

11. Does your family own agricultural property?

- ○ Yes
- ○ No

12. Have you ever lived on a farm or ranch?

- ○ Yes
- ○ No

13. How would you rate your level of scientific knowledge?

- ○ Low
- ○ Somewhat Low
- ○ Average
- ○ Somewhat Average
- ○ High

14. During the past 3 days, approximately how many of your meals were eaten outside of your home?

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ More
- ○ None

College Students' Perception of Organic and Genetically Modified

15. What is the average bill for a meal when you eat outside of your home?

- ◯ $5
- ◯ $5.01 - $10
- ◯ $10.01 - $15
- ◯ More Than $15

16. When you dine out, do you ever (check all that apply):

- ☐ "Count" Calories
- ☐ Ask About Carbohydrates
- ☐ Ask About Fats
- ☐ Look for "Healthy" Items
- ☐ Think of the Meal as a Treat
- ☐ Worry About the Cost

17. Age

- ◯ 18
- ◯ 19
- ◯ 20
- ◯ 21
- ◯ 22
- ◯ 23
- ◯ Other

Other (please specify)

18. Gender

- ◯ Male
- ◯ Female

19. Class

- ◯ Freshman
- ◯ Sophomore
- ◯ Junior
- ◯ Senior
- ◯ Graduate Student

College Students' Perception of Organic and Genetically Modified

20. Assuming the prices were the same, I would rather buy organic food than "regular" food.

- ◯ Yes
- ◯ No
- ◯ Unsure

21. Assuming the prices were the same, I would rather buy genetically modified foods, than "regular" foods.

- ◯ Yes
- ◯ No
- ◯ Unsure

22. Given the opportunity, I would serve organic foods to my friends.

- ◯ Yes
- ◯ No
- ◯ Unsure

23. Given the opportunity, I would serve genetically modified foods to my friends.

- ◯ Yes
- ◯ No
- ◯ Unsure

24. Thanks for taking the time to fill out this survey. Please provide us with your email address for a chance to win one of three $100 Visa gift-cards.

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APPENDIX D

FOLLOW-UP EMAIL

Email will be sent one week after the initial Email.

Hello. I sent out an email asking for your participation in an online survey that I am conducting as part of my master's thesis research. I appreciate your willingness to participate in this survey, as I am certain your insights will be very interesting and helpful. Below you will find the link to the survey for your convenience. If you complete the survey by midnight on March 13, 2009, you will be entered in a drawing for one of three $100 Visa gift cards. Please let me know if you have any questions or have trouble entering the survey site.

Thank you again for your participation!

Megan Lawrence
megan.lawrence@okstate.edu
(913) 634-9596

Click on the following link to consent to participate in this study and to begin the survey:

http://www.surveymonkey.com/s.aspx?sm=hWHJhSzOMQIZuUVZqKEgyA_3d_3d

APPENDIX E

RANDOM NUMBERS ASSOCIATED WITH THE WINNERS

Random Integer Generator

Here are your random numbers:

51 362 193

Timestamp: 2009-04-20 02:05:05 UTC

Again! Go Back

Note: The numbers are generated left to right, i.e., across columns.

APPENDIX F

OTHER RESPONSES TO INFORMATION SOURCES

"Jurassic Park" b Michael Crichton	Epcot (Disney WOrld)Family Discusion	Internet	Science PodCasts
Animal Science Class	Food Health Classes	Internet articles	Science Websites
BBC.com	Friebds and family friends	Internet news siteS	Seminars
Biotechnology classes	Friends	internet research	Some class lectures
Biotechnology summer studying GM foods	Friends that are in Vet School or Agriculture at OSU	Internet research	Speaker Series
books	Friends that are into biotechnology	Internet Sources	talking with my uncles who are farmers in Kansas
Books from industry and scientific sources	Friends that work at FAFPC or are food majors	Internet sources, college courses, science fiction (don't laugh too hard)	text books
Books such as "Animal, Vegetable, Miracle," "Fast Food Nation," and "Hot, Flat, and Crowded"	friends, teachers	internet technology	Text Books
Boyfriend	Friends, teachers	periodicals	textbooks
class	Friends' discussions	Internet, "The Future of Food"	The future of food' DVD,
Class	Grandfather, Grandmother, Severeal Uncles, Father and Sister have Ag related living or graduate degrees and we talk about this. Sister is agronimist for pioneer	Internet. How could you leave this out?	Greenpeace Website
class discussions	Health books (related to food alergies and intolerances)	Lecture	This is in my major area of study.
class disscutions	hearing from elders and teachers etc	Lectures	this survey
classes	I do not know about it	Lectures and classes	Under Graduate In BioTechnology
Classes	I get a lot of my information from NGOs and other sorts of watchgroups.	many classes on the subject and term papers written	variety of sources throughout the internet (ex:gov't sites)
Classes at OSU	I have no idea what that is	materials presented in class	web news
Classes I have taken	i have not actively sought	my experiences/ education in	Web reports
classes i've taken in collage have talked some about this	to learn about biotecnology.	an Animal Science curriculum	Wickipedia / Science magazines
Classroom	i have visited a genetically modification risk research center in northern Italy	My Uncle works in Genetically Modified Foods	Wife is in agro business
classroom discussions	I wrote two research papers on this subject.	none	word of mouth
Classroom Lecture	In my English comp II class a student presented a research paper over the subject.	None	Word of Mouth
classroom-ag classes	internet	NONE- i know NOTHING	working for USDA and tour of Syngenta in London
cnn/ internet		about any of this survey	World Wide Web
College		none.	youtube videos
College classes		None.	"nutrition
College Course		None. I have no clue what	by natalie"
college course (it was a lecture topic)		it is.	
college courses		online	
College Courses		online news sites	
college education in biology college		Online news-sites such as CNN/MSNBC, etc.	
gepgraphy class		parents	
Country World		Peers/word of mouth	
courses previously taken		Powerpoint Presentation	
Direct information from professors and researchers in biotechnology from classes and labwork. I am a biochemistry major.		Professors	
		radio	
Discussion with experts		research paper	
Documentaries		Research Project	
Educators		school	
		School	
		School, and the Internet	

VITA

Megan Renee Lawrence

Candidate for the Degree of

Master of Science

Thesis: COLLEGE STUDENTS' PERCEPTIONS AND INFORMATION SOURCES REGARDING ORGANIC AND GENETICALLY MODIFIED FOOD INDUSTRIES

Major Field: Agricultural Communications

Biographical:

Personal Data: Born in Lawrence, Kansas on July 19, 1985 to Kevin and Dyla Lawrence. Raised on a family farm with a older sister and younger brother.

Education:

Graduated from Tonganoxie High School, Tonganoxie, Kansas, May 2003; received an Associate degree in Agriculture from Connors State College, Warner, Oklahoma in May 2005; received an Bachelors of Science degree in Agricultural Communications from Oklahoma State University, Stillwater, Oklahoma in May 2007. Completed the requirements for the Master of Science in Agricultural Communications at Oklahoma State University, Stillwater, Oklahoma in July 2009

Experience: Raised in a rural area of Leavenworth County, Kansas, interned at WIWB-TV in 2006; interned at Oklahoma Horizon in 2007; interned at KCTV 5 news in 2008; employed as a graduate assistant for Edmon Low Library 2007-2008; employed as a graduate assistant form Career Services 2008-2009

Name: Megan Lawrence Date of Degree: July, 2009

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: COLLEGE STUDENTS' PERCEPTIONS AND INFORMATION SOURCES REGARDING ORGANIC AND GENETICALLY MODIFIED FOOD INDUSTRIES

Pages in Study: 91 Candidate for the Degree of Master of Science

Major Field: Agricultural Communications

Scope and Method of Study: Oklahoma State University students' perceptions toward the organic and genetically modified food industries and what information sources students use to learn about these industries was measured through online survey methods. The population consisted of both undergraduate and graduate students at OSU.

Findings and Conclusions: In general, college students perceive organic foods as healthy, no to low risk with consumption, and environmentally friendly. However, students are neutral or have no opinion in regards to genetically modified foods. Students do associate more of a risk with genetically modified foods than organic foods. College students' main source of information is television and newspapers. Recommendations for further research in the area of college students' perceptions about organic and genetically modified foods were made.

ADVISER'S APPROVAL: D. Dwayne Cartmell